

The Center for Neurotoxicology and Exposure Assessment
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New Jersey

The Center for Childhood Neurotoxicology and Exposure Assessment initially had 5 inter-related clinical and basic science studies. The overall aim of the Center is to address the effects of environmental chemicals on neurodevelopment and especially in regards to the expression of autism. Children with autism have several features that suggest that their autism may be altered by environmental factors including chemicals. These factors include altered brain growth during prenatal and postnatal development, regression or loss of function in almost a third of the children at the time the children begin to explore their environment, chemicals such as thalidomide that appear to increase the incidence of autism, and the possibility that the incidence of autism is increasing in the population. The original 3 basic science studies will be briefly presented which study the effects of environmental chemicals on neurogenesis and regional brain growth; adhesion and repulsion molecules; and a developmental animal model of chemical induced regression and retardation. In addition, 3 other exciting studies that have been added to the Center's scope of work will be discussed including gene environmental studies and computational toxicology. Lastly the Center's two clinical studies will be presented that address the two main hypothesis that children with autism may be at higher risk of exposure to environmental chemicals as compared to controls and the expression of regression and altered brain growth in children with autism may be related to exposure to environmental chemicals and a potential gene-environment interaction. The interaction between all of the clinical and basic studies will be highlighted as well as the Center's activities reaching out to other NIH and CDC autism and non autism Centers to conduct collaborative work as well as the autism community and other communities.

ADVERSE NEUROBEHAVIORAL CONSEQUENCES OF LOW-LEVEL EXPOSURE TO ENVIRONMENTAL TOXINS: THE CINCINNATI CHILDREN'S ENVIRONMENTAL HEALTH CENTER

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Background: There is increasing evidence that environmental exposures during fetal development and early childhood are major contributors to disease and disability in childhood and adulthood.

Introduction: The adverse neurobehavioral effects of fetal and early childhood exposures to numerous environmental toxins, including lead, mercury, PCB's and environmental tobacco smoke (ETS), are reasonably well established. Still, many studies linking environmental toxins with neurobehavioral and reproductive effects typically involved children who had relatively high exposures or relied almost entirely on observational studies. The relationship of exposures to other environmental toxins, such as pesticides, and the interaction of various toxins are unclear. Moreover, the best biomarkers to measure fetal exposure to toxins are uncertain.

Methods: Our Center is undertaking numerous studies to identify and validate biomarkers of fetal and early childhood exposure to prevalent toxins, including maternal hair, maternal blood and urine, cord blood and meconium. We are also conducting randomized controlled trials to examine the effect of reducing exposures to environmental hazards, such as lead, ETS and physical hazards. In two existing longitudinal cohorts, we are examining the long-term consequences of exposure to prevalent toxins, including the relationship of childhood lead and ETS exposure with dental caries, criminality and ADHD. Finally, we are exploring gene-environment interactions to enhance our understanding of mechanisms of disease and identify susceptible populations.

Implications: These longitudinal studies will test whether low-level exposure to prevalent toxins is associated with prevalent diseases and disorders in children. Moreover, while observational studies are important, we will test the safety and efficacy of interventions to lower exposures to prevalent and persistent toxins using randomized trials. The Children's Environmental Health Centers offer a tremendous opportunity to conduct translational, community-oriented research to explicate underlying mechanisms of disease and prevent disease and disability.